ANZCA
FPM

Friday 20 December 2024

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Secretary
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Dear Prof Wallace,

ANZCA's feedback to the proposed amendment of the Australasian Health Facility Guidelines on nitrous oxide

Thank you for providing the opportunity for the Australian and New Zealand College of Anaesthetists (ANZCA or the college) to provide feedback in response to your letter dated 18 November 2024, following the request from the Australasian Health Infrastructure Alliance (AHIA) proposed amendment to the Australasian Health Facility Guidelines (AusHFG).

Our Environmental Sustainability Network (ESN) Executive members Dr Cas Woinarski, Dr Rebecca McIntyre, Dr Archana Shrivathsa and Prof Eugenie Kayak have expertly provided this detailed feedback on behalf of the college. The feedback relates to the proposed amendment to the current guidelines regarding installation of reticulated nitrous oxide in new healthcare facilities, including the use in maternity and paediatric services.

ANZCA supports the recommendation that piped nitrous oxide is no longer a mandatory requirement for any hospital, provided a redundant point of care nitrous oxide supply is in place. ANZCA also supports efforts to reduce nitrous oxide infrastructure leak, and the changes proposed by AHIA.

Climate health is a public health emergency[1]. In October 2024, ANZCA committed to the Australian Commission on Safety and Quality *Joint Statement on Working together to achieve sustainable high-quality health care in a changing climate*[2]. ANZCA recognises that reducing emissions from nitrous oxide is part of the National Health and Climate Strategy[3]. ANZCA is concerned about the reports of significant nitrous oxide leaks in Australia and Aotearoa/New Zealand and abroad.

Feedback on proposed amendment

ANZCA has been asked to provide comments on a proposed amendment to the AusHFG relating to piped nitrous oxide and wall outlets. ANZCA interprets the intention of this change is not to limit administration of nitrous oxide where patients or clinicians require it, but to allow Australian and New Zealand healthcare facilities to adopt similar processes that exist in United States of America, United Kingdom and Ireland in efforts to combat nitrous oxide leaks[4,5].

The proposed amendment reads:

> *The use of nitrous oxide in operating theatres, procedural suites and emergency departments is declining. Reticulated nitrous oxide and associated scavenge outlets are not mandatory for any healthcare service and point of care cylinders can meet clinical requirements for the majority of healthcare facilities. Where found to be clinically necessary, the provision of nitrous oxide via piped outlets or via cylinder is to be determined at a project level, based on an assessment of expected clinical need and associated risk assessment, particularly for services with high utilisation such as birthing suites. Birthing suites may have a dedicated reticulated nitrous oxide system, whilst the rest of a facility is supplied by point of care cylinders.*

We have provided our perspectives on the operational consideration items identified in the letter, which may be useful to pass onto AHIA:

Monitoring and measurement of usage

Whilst historically challenging, recent advancements have made monitoring of administered volumes of nitrous oxide possible. ANZCA suggests that a multidisciplinary team consisting of engineers and anaesthetists, or other suitable staff regularly monitor purchasing and clinical administration. Efficiency targets should be set by national or state/territory health services to motivate hospitals to improve where discrepancy is identified.

All healthcare facilities should be encouraged to monitor their nitrous oxide usage and procurement. The facilities that are likely to require the greatest quantities of nitrous oxide are facilities with birthing units and specialised paediatric hospitals[6,7]. The usage patterns are different between these two circumstances:

a) Birthing units require nitrous oxide for labour analgesia or procedural sedation. Labour analgesia in particular can result in many hours of nitrous oxide administration which translates to larger volumes being administered per episode of care. As delivery suites are often located in a single area of a hospital, it may be feasible to maintain a dedicated piped system with appropriate monitoring to detect and manage usage volumes and leaks.

b) Specialised paediatric hospitals require frequent, small volumes of nitrous oxide in theatre, anaesthetic bays and procedure rooms. Often these are in multiple areas of the hospital. Site specific needs analysis will be necessary to determine whether point of care cylinders are a feasible alternative to piped nitrous oxide.

An alternative to nitrous oxide being blended with oxygen at point of care is pre-mixed 50:50 nitrous oxide and oxygen. This may be suitable for some, but not all, uses of nitrous oxide in a healthcare facility. Again, relevant monitoring should be performed to decrease waste.

ANZCA supports the development of protocols and regulations to ensure the minimisation of vented amounts of nitrous oxide to the atmosphere from cylinders returned to the suppliers.

Management of leakage

Significant leaks are currently being reported despite adherence to relevant Australian Standards and equipment maintenance schedules[7,8,9,10]. It is important to note that nitrous oxide was used in significantly greater quantities in previous decades. As a result, leaks that previously would have been insignificant, now can account for most of a hospital's procured nitrous oxide supply.

With the support of ANZCA, anaesthetists are involved in improvements to Australian Standards and relevant standards are undergoing revision. In the United States of America, United Kingdom and Ireland, healthcare facilities have demonstrated significantly decreased nitrous oxide leaks when point of care cylinders are used to supply nitrous oxide instead of reticulated infrastructure[4,11,12]. A growing number of hospitals across Australia and New Zealand are implementing portable nitrous oxide supply where it is feasible, and amendments to the AusHFG will assist these facilities and enable other facilities to follow suit.

Workplace Health Safety requirements relating to the use of cylinders

Relevant manual handling processes should be adhered to. These are already in place in healthcare facilities as many other gases are supplied to healthcare facilities in cylinder form.

Approach to the provision of scavenge where cylinders are used

Scavenging is the removal of anaesthetic gases from the clinical environment[13]. Adequate scavenging can mitigate occupational exposure but does not prevent the environmental harm of

administered nitrous oxide unless nitrous oxide destruction technology is incorporated into its design[14]. Scavenging can occur via appropriate length tubing to portable equipment.

Data on occupational exposure demonstrate frequent exposure to levels of nitrous oxide above the recommended safe levels as per Safe Work Australia[15,16]. Nitrous oxide scavenging could protect staff in high-risk environments, whilst nitrous oxide monitors could provide insights into occupational exposure and effect of strategies to reduce exposure[17,18].

The ability to provide adequate scavenging will depend on:

a) Breathing circuit used to administer nitrous oxide
b) Equipment and infrastructure to scavenge exhaled nitrous oxide with or without destruction technology.

Occupational exposure should theoretically be lower in environments where cylinders are used, compared with piped outlets. Cylinders can leak at fewer points than nitrous oxide reticulated infrastructure, which have been shown to leak at many points, continuously and insidiously[10].

Current scavenging systems in anaesthesia workstations are effective within the use of a closed breathing system, but do not address nitrous oxide leaks which occur outside the anaesthesia machine (e.g. at wall outlets), whether cylinders or reticulated nitrous oxide are used[19]. Notably, for scavenging to be most effective, the expired gas needs to be exhaled into the limb of the breathing circuit.

Scavenging is recommended as per the AusHFG for operating rooms, birthing rooms and procedure rooms[20,21,22]. Australian Standard 1668.2 pertains to air flow requirements for room types[23]. The Standard states a requirement for a number of air exchanges per hour for operating and procedure rooms, but not for birthing rooms.

Nitrous oxide destruction technology is available to break down nitrous oxide into inert gases after it has been administered in centralised or portable methods. Currently, there is not enough evidence to support its widespread use in Australia. There may be a specific role for nitrous oxide destruction to be installed for birthing units. These have shown to decrease occupational exposure to staff and have potential environmental benefits demonstrated under ideal conditions, but the portable units are bulky, and the centralised units require dedicated scavenging systems[17,19]. These will not address nitrous oxide leak that occurs prior to the point of clinical administration.

Appropriate storage of cylinders

Relevant safety standards and storage requirements should be adhered to.

Security of gas sources given it is used as a recreational drug

Healthcare facilities and medical gas companies should ensure that tracking systems are part of the supply contract to ensure that all cylinders that are delivered are returned to the supplier. There may be potential diversion risks, but reliance on piped nitrous oxide does not eliminate this risk. In contrast, multiple unmonitored nitrous oxide outlets pose an existing diversion risk.

ANZCA recognises that whilst nitrous oxide is often classified as an anaesthetic gas, other health professionals administer nitrous oxide for analgesia or procedural sedation and their comment should be sought. Specifically, dentists, midwives, obstetricians, paediatricians, emergency physicians, general practitioners and nurse practitioners should be considered stakeholders when discussing nitrous oxide infrastructure regulations.

There are possible financial considerations when establishing a portable supply of nitrous oxide. Government grants to retrofit anaesthetic machines and nitrous oxide delivery devices would be welcomed, noting these retrofits are not individually expensive. Alternatively, there are situations

where nitrous oxide supply to theatres is required infrequently. In these situations, systems that do not require anaesthetic machine modification can be adopted safely, as demonstrated at the Prince Charles Hospital in Queensland[24].

ANZCA supports the availability of nitrous oxide to every patient who requires it, however there is room for widespread improvement of system management and delivery of nitrous oxide as a public health measure. ANZCA supports the recommendation that piped nitrous oxide is no longer a mandatory requirement for any hospital, provided a redundant point of care nitrous oxide supply is in place. ANZCA would like to acknowledge its fellows who have been working to address this issue in a prompt manner.

Your sincerely,

Prof Dave Story
ANZCA President

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